BASEMENT

MASSACHUSETTS INSTITUTE of TECHNOLOGY
LIBRARIES

PASEMENT

HD28
.M414
no. 1481-83
c.2

DEWEY LIBRARY
LIBRARIES

WORKING PAPER
ALFRED P. SLOAN SCHOOL OF MANAGEMENT

MANAGING INFORMATION SYSTEMS CAREER PATHS

by

Thomas A. Barocci
Kirsten R. Wever

WP# 1481-83 September 1983

MASSACHUSETTS
INSTITUTE OF TECHNOLOGY
50 MEMORIAL DRIVE
CAMBRIDGE, MASSACHUSETTS 02139

MANAGING INFORMATION SYSTEMS CAREER PATHS

by

Thomas A. Barocci
Kirsten R. Wever

WP#1481-83 September 1983

MANAGING INFORMATION SYSTEMS CAREER PATHS

Introduction

Over the next ten years the success of many businesses will turn on the fundamental information systems (I/S) and computer skills of all of their personnel. At the same time, more and more firms will experience difficulties in getting the right kinds of I/S professionals to design, install and service the systems they will increasingly come to rely on. The problem will be due largely to the fact that the dynamics of I/S careers have been *ad hoc*, in contrast to relatively structured career paths in most functional areas of U.S. business organizations. The adequate integration of the right kinds of I/S personnel (and thus I/S departments/divisions) can only be achieved on the basis of careful and purposive recruitment, motivation, promotion and continuing training/education of I/S personnel.

At the same time, it will be necessary to take into account the rapidly changing nature of the I/S field itself, and the role of I/S departments/divisions within the firm. The era of the supply-driven I/S environment is rapidly drawing to a close. Users are no longer willing to demand simply what I/S decides, or is able, to supply. The technical sophistication of user departments is growing rapidly; at the same time user demands pose more challenges to I/S departments

This paper was written as part of the Human Resource Policy Project, Center for Information Systems Research (CISR), Alfred P. Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02139. The authors would like to thank the individual participants and corporate sponsors who took part in this study. Their names are not mentioned herein due to our confidentiality agreements with them. Thomas A. Barocci is Senior Lecturer at the Sloan School of Management; Kirsten R. Wever is a Ph.D. candidate at MIT; Debra A. Tessier was a masters student at the Sloan School. Special thanks are due Ms. Christine V. Bullen, Assistant Director of CISR and Marc Gordon, our user oriented research assistant.

than they have in the past. In order to meet these challenges I/S personnel at all levels will be called upon to hone their user-liaison, and business consulting skills, and possibly even more important, their functional skills.

Growing user sophistication is not the only reason why management must develop a better understanding of I/S career paths and I/S professionals' career-related motivations and aspirations. Equally crucial is the fact that the importance of the I/S function within the firm has grown in quantum terms over the last 5-10 years; special I/S technologies now provide critical bases of both domestic and international competitiveness in a wide range of firms and industries, particularly where the relevant information derives from transaction processing.

Finally, I/S professionals themselves are clamoring for more employer involvement in the development of their careers.* To ignore their preferences is to run the risk of alienating, losing, or ensuring low productivity among a group of professionals that is and will continue to be in high demand and short supply.

The bottom line is, of course, market competitiveness. The human resource aspects of I/S are fundamental to the productive integration of I/S departments, divisions and personnel into the companies that will rely on them more and more to maintain economic competitiveness throughout the 1980s and 90s. The I/S field is technology-driven; the I/S environment has become demand-driven. If I/S departments supply personnel, products and services that

*Barocci, Thomas A. and Kirsten R. Wever, "Human Resource Planning for Information Systems Personnel," MIT Sloan School of Management Working Paper #1478-83. ;1983.

inadequately meet user needs, user departments can now turn to outside vendors, or "do it themselves" by hiring their own I/S personnel or consultants.

The purpose of this paper is to consider three aspects of I/S careers in the context of the technological dynamics of the field: 1) the typical career patterns of I/S professionals; 2) the career aspirations of these professionals; and 3) the career models and paths that will be prescribed by changes in the nature of I/S as a field, and in the role of I/S within the firm. This analysis will allow us to explore some more specific career structures necessary to anticipate the future technological dynamics of the I/S field.

This paper is based on a series of 800 interviews and questionnaires gathered at 18 firms in a variety of industrial sectors. The database discussed here includes responses from personnel in the following job categories: programmer, systems analyst, technical staff, project leader, project manager, systems development manager, technical staff manager and I/S director. The respondents each completed a lengthy questionnaire covering issues concerning their job descriptions, educational and professional development, career paths (past and expected), recruitment and hiring experiences, and evaluation of colleagues, supervisors, and managers.*

Observed I/S Career Paths:

We begin with a description of the past career paths of the respondents in our eight job categories, separating these into

*Human Resource Policy Project, Center for Information Systems Research, Sloan School, M.I.T.

managerial and non-managerial respondents.** We will then examine the career aspirations of these two groups of respondents and juxtapose these aspirations against projected future I/S skills-mix requirements.

Among all four non-managerial job categories (programmer, systems analyst, technical staff, project leader), programming provides by far the most common background experience. Of the programmers, almost two-thirds had also been programmers in their previous two jobs within the same firm. About half had been programmers in their previous two jobs at other firms. Those who had been with their present companies long enough to have held four or five prior positions there had all had experience in systems analysis and/or as technical staff. (Current career paths in I/S are aggregated and illustrated in Figure 1.)

Somewhere between 2/3 and 3/4 of the systems analysts, technical staff and project leaders had also been in the same job category in their previous positions. Prior to that, the systems analysts' experience was heavily in programming. Many of the technical staff respondents had also been systems analysts and/or programmers; the project leaders were drawn from programming, systems analyst and technical staff positions.

The role of programming is also strong in the past career paths of the managerial respondents. Among the project managers, systems development managers and technical staff managers, a good proportion of the respondents had previous experience in both programming and project leadership. A number of the project managers also had

**A requirement for participation in the sample group included managerial or supervisory experience. The "non-managerial" category represents those respondents whose current job responsibilities are non-managerial.backgrounds as systems analysts and technical staff.

Not surprisingly, systems development managers had a good deal of experience as systems analysts, and technical staff managers' backgrounds included many technical staff positions.

The backgrounds of the I/S directors are by far the most eclectic of all our job categories. 80% had been I/S directors in their previous jobs within the firm. Of those that had been with their present firms long enough to hold several positions there, the largest percentage came from systems development management positions, but significant numbers had also been project managers, technical staff managers, operations managers, planning managers and telecommunications managers. Those who had held four or five positions within their current firms had been distributed across positions in project leadership, systems analysis, user liaison, telecommunications, technical staff and project management. (Almost one-fifth had been programmers with previous companies.)

This analysis reveals two particularly noteworthy results. First, programming furnishes the most common prior experience across all job categories. Second, while the directors' backgrounds are distributed among a wide range of I/S positions, most of them began as programmers at previous firms. It is also apparent that the overwhelming majority of our respondents' career paths are concentrated in one particular area of the I/S field. For example, technical staff managers have technical staff experience, systems development managers used to be systems analysts, and so on. This uniformity applies to almost all of our job categories. (See figures 2 & 3.)

I/S Career Aspirations:

The career aspirations of our respondents do not entirely mesh with the trends implied from past promotional paths. The non-managerial respondents aspire (from the programmer and technical staff levels) first to positions in project leadership and systems analysis; from there the majority would like to go into systems development management (most of the remaining correspondents seek technical staff management and project management jobs at this stage); finally, they aspire overwhelmingly to I/S directorships.

The managerial respondents were interested in a slightly wider range of future jobs, including management positions in systems development, telecommunications, technical staff and other I/S positions not included on the list in our questionnaire. The systems development managers and particularly the I/S directors aspired to "other positions". (It is noteworthy that five percent of the I/S directors hoped for jobs in operations management.)

At this point it will be useful to consider what I/S career paths will look like in the future, based on technological trends in the field. Projected I/S career paths are juxtaposed on past career paths in figure 4. There is an obvious gap between the respondents' career aspirations and the projected career paths shown in figure 4. (Compare figure 4 with figures 5 and 6.) On the one hand, I/S directorships are the most sought-after positions among our respondents; on the other hand, positions in special technologies and management support systems (MSS) are projected to be of increasing importance in the future. It is clearly impossible for all those respondents who ultimately aspire to I/S directorships actually to attain that position. There are only so many I/S directorships to go

FIGURE 1

CURRENT CAREER PATHS

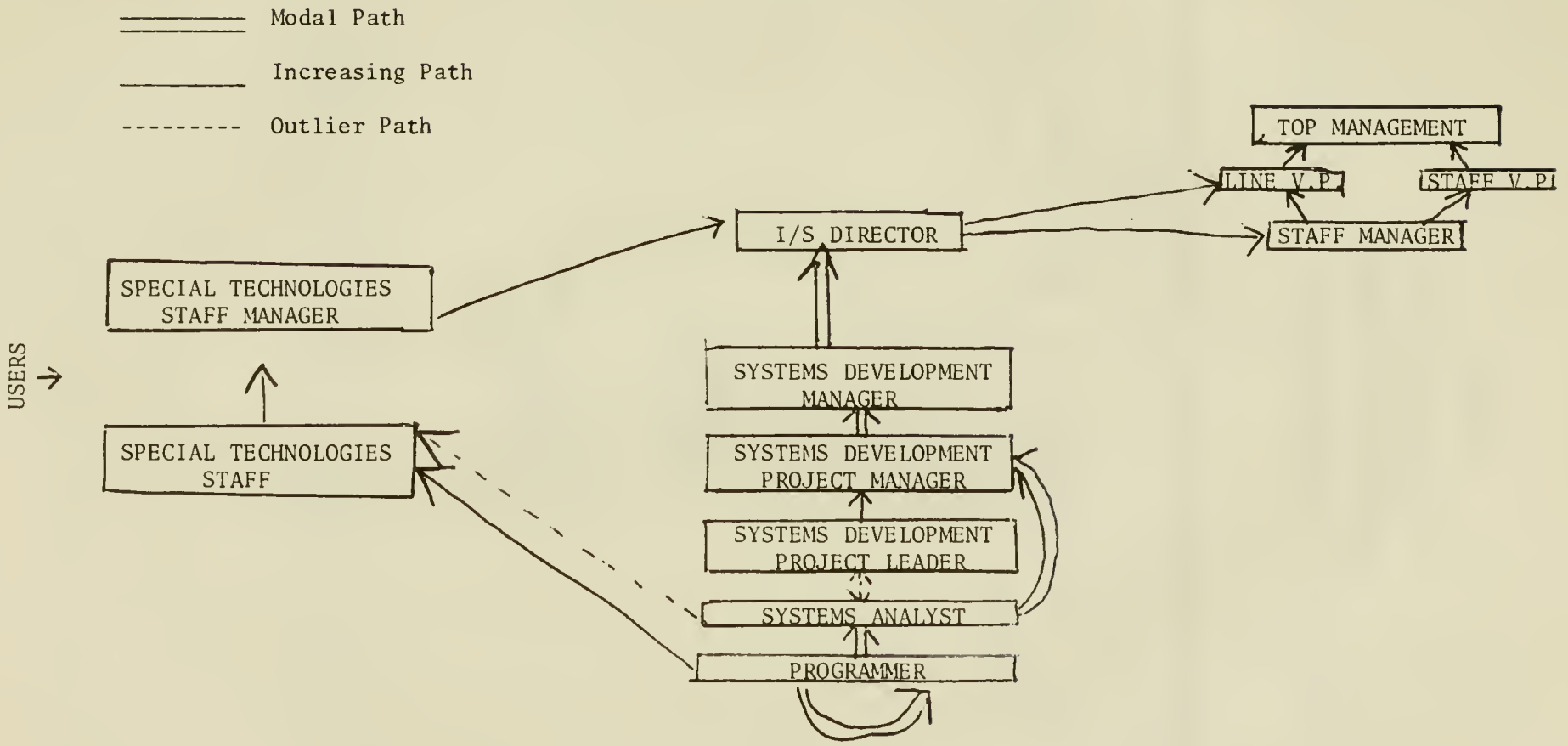
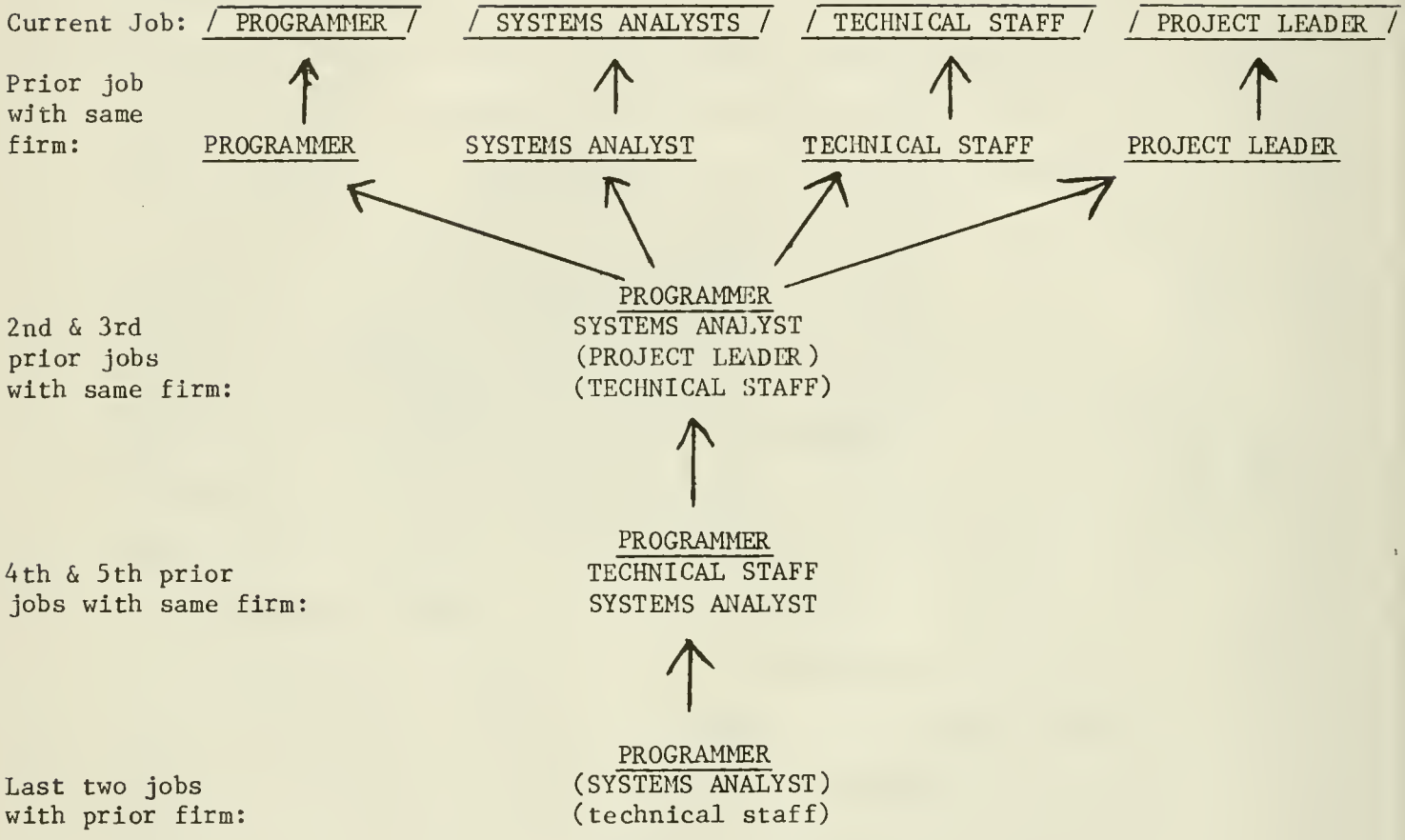


Figure 2

NON-MANAGERIAL RESPONDENTS'

PAST CAREER PATHS

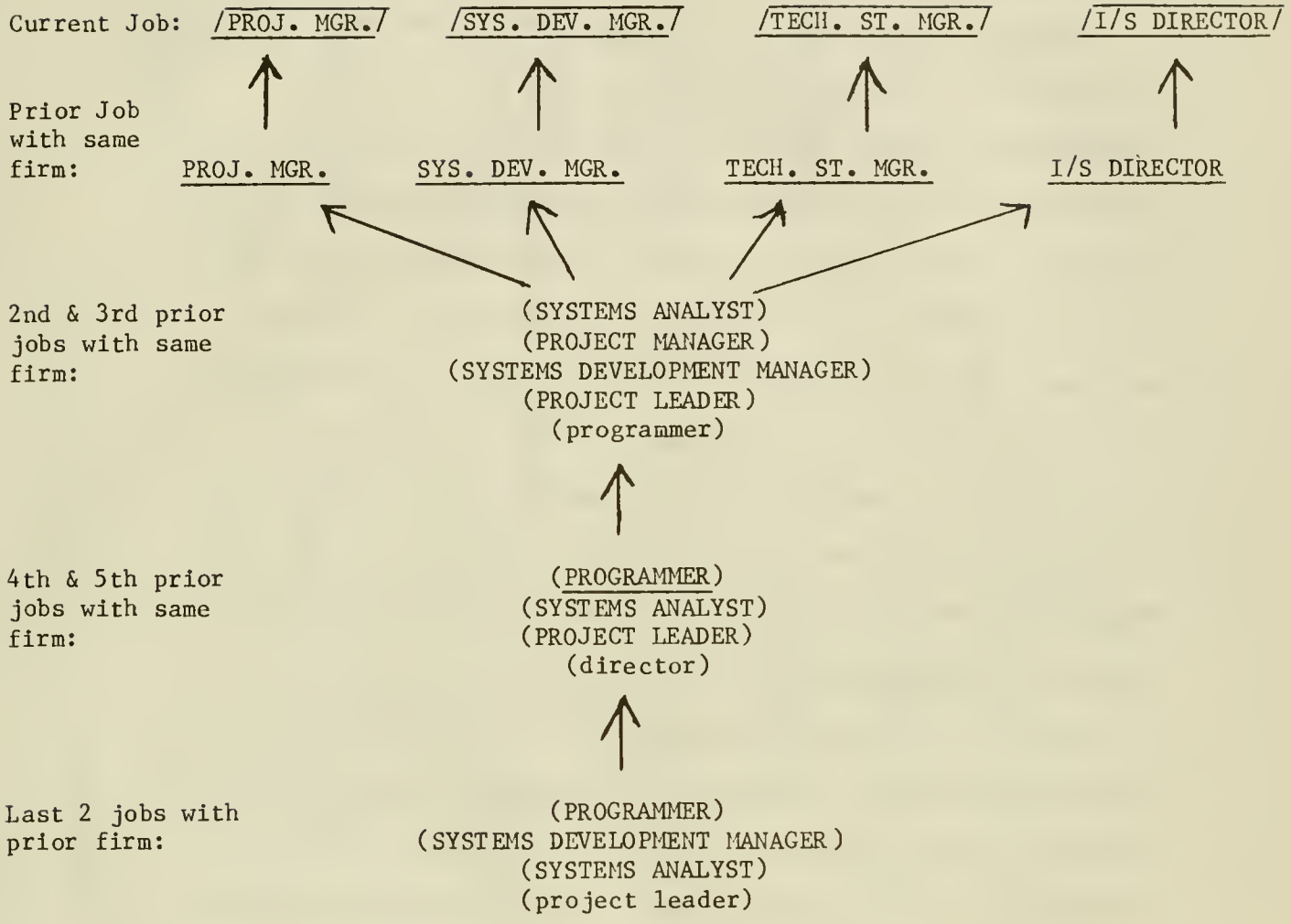


Key:

POSITION = over 50% of respondents
POSITION = 30-50% of respondents
(POSITION) = 15-29% of respondents
(position) = 10-14% of respondents

Figure 3

MANAGERIAL RESPONDENTS'
PAST CAREER PATHS


Current Job: /PROJ. MGR./ /SYS. DEV. MGR./ /TECH. ST. MGR./ /I/S DIRECTOR/
Prior Job with same firm: PROJ. MGR. SYS. DEV. MGR. TECH. ST. MGR. I/S DIRECTOR
2nd & 3rd prior jobs with same firm:
(SYSTEMS ANALYST)
(PROJECT MANAGER)
(SYSTEMS DEVELOPMENT MANAGER)
(PROJECT LEADER)
(programmer)
4th & 5th prior jobs with same firm:
(PROGRAMMER)
(SYSTEMS ANALYST)
(PROJECT LEADER)
(director)
Last 2 jobs with prior firm:
(PROGRAMMER)
(SYSTEMS DEVELOPMENT MANAGER)
(SYSTEMS ANALYST)
(project leader)

Key:

POSITION = over 50% of respondents
POSITION = 30-50% of respondents
(POSITION) = 15-29% of respondents
(position) = 10-14% of respondents

around. At the same time, it is evident that in the absence of career structuring programs there will be a severe shortage of I/S professionals aspiring to move into special technologies and MSS.

Finally, the projected I/S career paths illustrated in figure 4 indicate the increasing involvement of users at all levels. Consequently, the user liaison function will also grow in importance. But our respondents were largely uninterested in this position. It is true that the average respondent considered his/her role in increasing user satisfaction to be important. In the aggregate, 92% either agreed or strongly agreed to this proposition (of which two-thirds agreed strongly). But at the same time, a surprisingly large number of the respondents saw the user liaison position as being either a "dead end" (on average, 7.5%) or outside the career ladders leading to higher technical and/or managerial positions (in the aggregate, 33%).

No firm can alter the technological trends that will drive the I/S field in the next ten years. What management can do, however, is to develop corporate policies that bring the skills of their I/S personnel in line with the challenges those trends will pose in the future. The following section considers these technological dynamics in more detail.

The I/S Context

Three "macro-trends" are of particular significance here.* The first is the trend toward distributed processing, which has three

*Lahey, Richard Alleyn, "Technology, Trends and Information Systems Professionals," Masters of Science Thesis, MIT Sloan School of Management, May 1983.

FIGURE 4

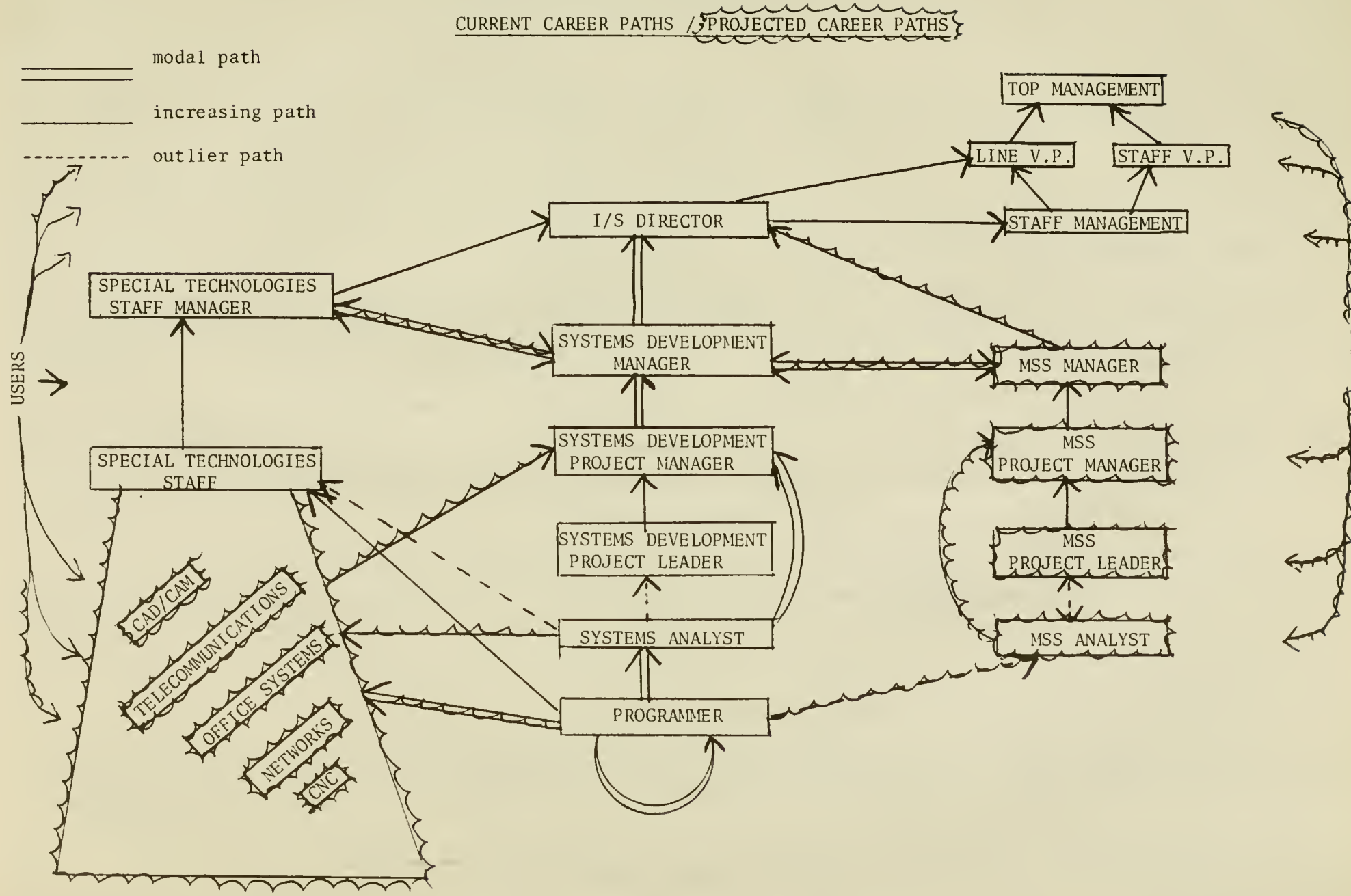

CURRENT CAREER PATHS / PROJECTED CAREER PATHS
modal path
increasing path
outlier path
TOP MANAGEMENT
LINE V.P.
STAFF V.P.
I/S DIRECTOR
STAFF MANAGEMENT
SPECIAL TECHNOLOGIES STAFF MANAGER
SYSTEMS DEVELOPMENT MANAGER
MSS MANAGER
SPECIAL TECHNOLOGIES STAFF
SYSTEMS DEVELOPMENT PROJECT MANAGER
MSS PROJECT MANAGER
SYSTEMS DEVELOPMENT PROJECT LEADER
MSS PROJECT LEADER
SYSTEMS ANALYST
MSS ANALYST
PROGRAMMER
CAD/CAM
TELECOMMUNICATIONS
OFFICE SYSTEMS
NETWORKS
CNC
USERS
USERS

FIGURE 5

JOB ASPIRATIONS; NON-MANAGERIAL RESPONDENTS

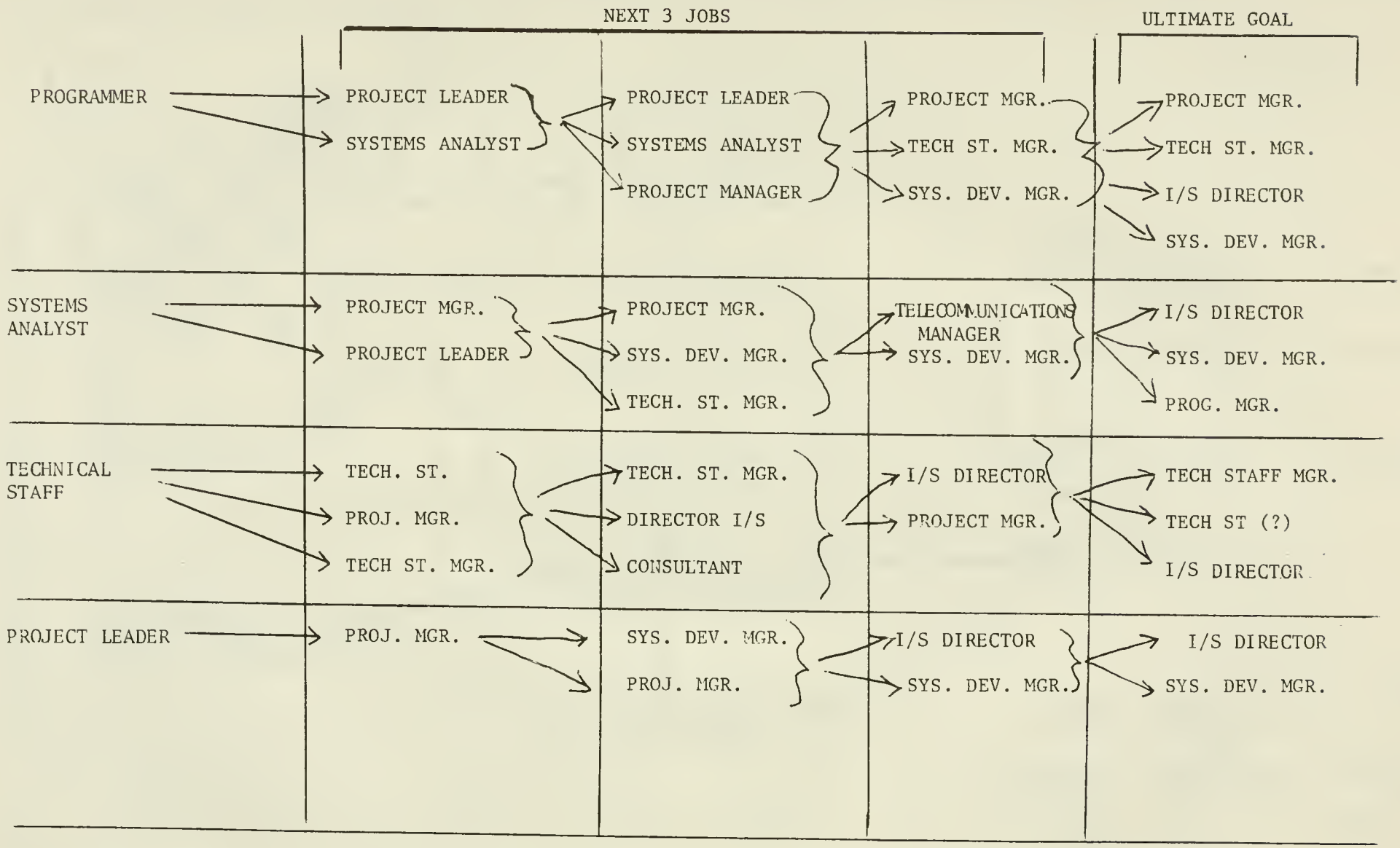
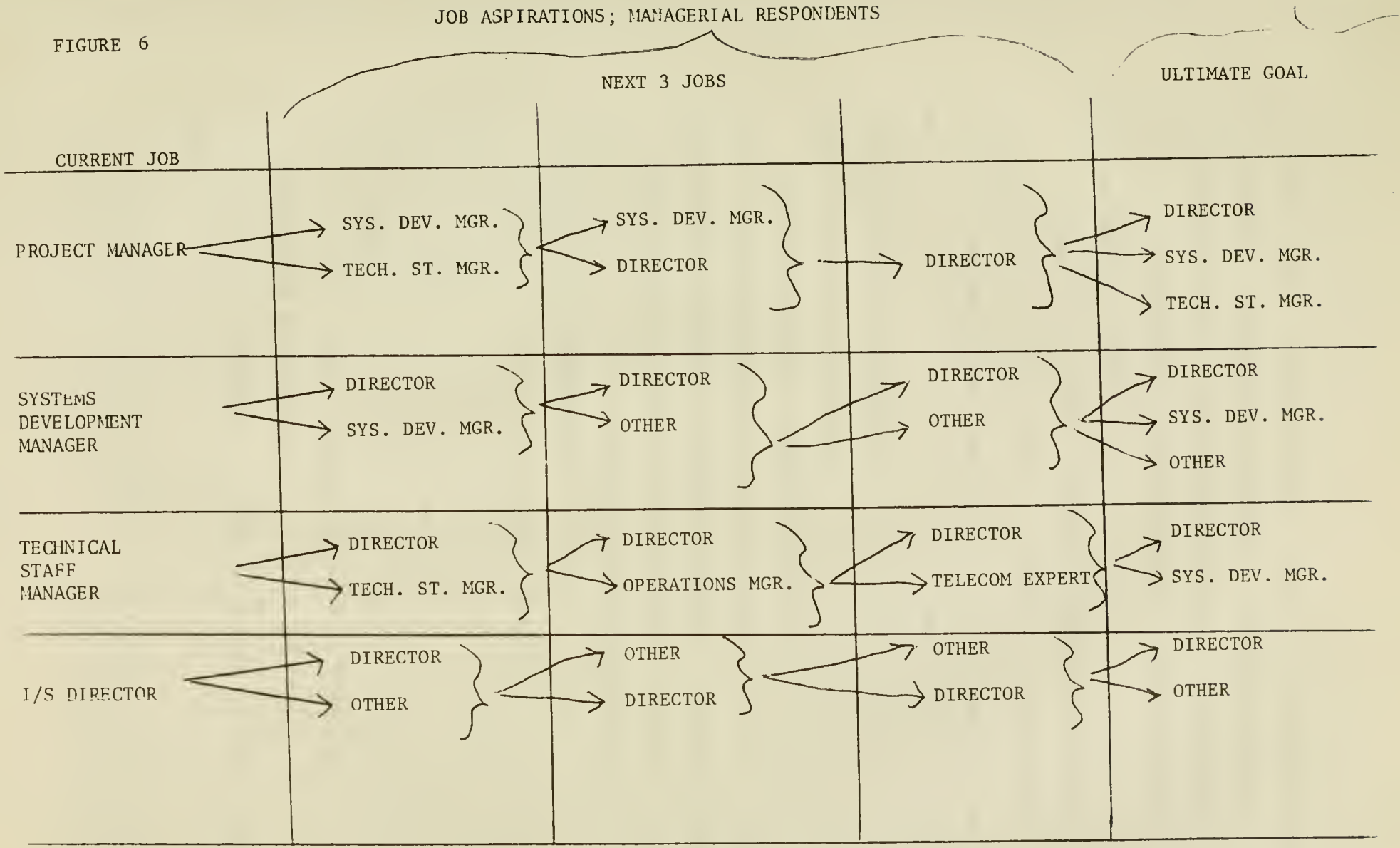


FIGURE 6


JOB ASPIRATIONS; MANAGERIAL RESPONDENTS
NEXT 3 JOBS
ULTIMATE GOAL
CURRENT JOB
PROJECT MANAGER
SYS. DEV. MGR.
TECH. ST. MGR.
SYS. DEV. MGR.
DIRECTOR
DIRECTOR
DIRECTOR
SYS. DEV. MGR.
TECH. ST. MGR.
SYSTEMS DEVELOPMENT MANAGER
DIRECTOR
SYS. DEV. MGR.
DIRECTOR
OTHER
DIRECTOR
OTHER
DIRECTOR
SYS. DEV. MGR.
OTHER
TECHNICAL STAFF MANAGER
DIRECTOR
TECH. ST. MGR.
DIRECTOR
OPERATIONS MGR.
DIRECTOR
TELECOM EXPERT
DIRECTOR
SYS. DEV. MGR.
I/S DIRECTOR
DIRECTOR
OTHER
OTHER
DIRECTOR
OTHER
DIRECTOR
DIRECTOR
OTHER

immediate implications for human resource planning. First, business skills become more important since distributed systems are by their nature user-oriented (primarily reflecting the functional needs of a specific user department). Second, technical skills relating to communications protocol, network design and optimization, and routing and switching take on greater importance with the increasing user-orientation of distributed systems. Third, I/S professionals will have to become teachers and consultants and master the interpersonal skills required by those roles.

The second macro-trend is toward packaged/purchased (as opposed to customized) software. As a result, more and more firms will be faced with the option of buying (as opposed to making their own) software. This will result in the increasing standardization of the programming function. Therefore programmers will become easier to train (and to replace), rendering each individual programmer less critical in the corporate I/S environment.

Finally, there is a macro-trend toward end-user computing. Again, this poses three human resource-related issues. To begin with, I/S professionals will come to need as much management acumen as technical expertise. Further, they will need to be familiar with the concrete issues underlying the logical structures (software) they present to end-users. Finally, the raison d' etre of I/S departments/divisions will shift away from automating organizational procedures, and toward enhancing end-user performance -- whatever that may involve.*

*Barocci, Thomas A. and Kirsten R. Wever, "Human Resource Planning for Information Systems Personnel," MIT Sloan School of Management Working Paper #1478-83, 1983.

Taken in sum, these trends imply the need for I/S professionals to take on many of the tasks of industrial psychologists and organizational behaviorists. They also lead us to draw some more specific inferences about the shape of future I/S career paths and how they might be structured.

To begin with, the career aspirations reported by technical staff and technical staff managers lean heavily in the direction of systems analysis and away from the fields of technological specialization that will come to be increasingly important in the I/S field. We infer that technically-oriented I/S personnel will require some incentives to stay in and develop these special technologies.

By the same token, not enough programmers and analysts are considering special technologies-related career moves. To foster movement in this directions, firms will undoubtedly have to undertake training and education programs that will equip non-technical staff employees with the skills necessary to the special technologies appropriate in any given setting.

Finally, we must conclude once more that there is a glaring gap between the career paths and aspirations of our respondents, on the one hand, and the increase in the importance of the user liaison function and in the sophistication and demands of users themselves, on the other. User-related jobs played minor roles, at best, in the past career paths of our respondents. Given the growing importance of MSS and user involvement in all aspects of I/S, this lack of interest in user-related career moves will soon present problems for I/S directors and managers who seek appropriate skill mixes.

Conclusion:

We arrive at the question, "What is to be done?" The answer must be predicated on an analysis of exactly how the technological dynamics of the field are likely to affect the necessary functions and skill mixes in any given firm. But once having arrived at these projections, what is to be done is relatively straightforward: on the one hand, managements can develop medium- and long-term human resource plans, training programs, and career development programs that will attain the skill mixes they will need to keep up with future technological trends in the field. Alternately, they can count on the I/S labor market to supply the right people at the right time. Given the high and growing demand for I/S professionals of all kinds, and given the discrepancies between current career aspirations and the skills mixes that will be necessary in the future, the "wait and rely on the market" approach seems more than a little short-sighted.

I/S Human Resource Planning is a complex undertaking, and has been dealt with in more detail elsewhere by the authors.* From the standpoint of the I/S department, or of top management in firms that rely heavily on MIS, there will be fewer and fewer logical alternatives as the decade progresses. From the standpoint of the firm, I/S career structuring will be self-evidently necessary in the near future, if it is not so already.

From the stand-point of the I/S professional, career-structuring is innately attractive. It is time to revise the standard view of the I/S professional as a technically-oriented

*Ibid.

loner. In fact, the overwheling majority of the I/S professionals in all eight job categories (particularly in the non-managerial positions) are very positively inclined toward employer involvement in their career developments. (Again, details on this subject have been covered elsewhere.**) If I/S professionals have appeared to be detached from their organizations and loyal only to their professions per se, one reason may be that top managements have failed to foster career-development programs and company loyalty.

The I/S field is still young. The enigmatic aspects of its technological dynamics continue to baffle users and I/S professionals alike. But without proactive career-development measures, users will find themselves inadequately supplied by their own I/S departments. As a result, they may turn to outside vendors for their I/S products and services. This course of action would reflect the fact that the I/S environment is now demand-driven. As technological possibilities determined probable demand, so demand will determine the supply of I/S products and services. The task within I/S is to structure career paths in such a way as to meet that demand competitively by supplying the user liaison, consulting and special technologies skills demanded by the future.

**c.f., Barocci, Thomas A. and Kirsten R. Wever, "Information Systems Careers," MIT Sloan School of Management Working Paper #1482-83, 1983

0506J:TAB:tmd:1481-83

Adams, Donald L., "Survey of Computer Cost Allocation Techniques."

Allen, Brandt, "An Unmanaged Computer System Can Stop You Dead," Harvard Business Review, November-December 1982, pp. 77-87.

Barocci, T.A., and Cournoyer, Paul E., "Make or Buy: Computer Professionals in a Demand Driven Environment," Working Paper 1342-82, Sloan School of Management, M.I.T., September 1982.

Barocci, T.A., "MIS/HRM Speech Outline," 6/8/83

Bologna, Jack, "Managing High-Tech Employees: Perceiving Their Unique Characteristics is Half the Battle," Computerworld, September 13, 1982, pp. 62-63.

Bulkeley, William M., "Microcomputers Gaining Primacy, Forcing Changes in the Industry," The Wall Street Journal, Thursday, January 13, 1983, p. 33.

Buss, Martin, D.J., "Managing International Information Systems," Harvard Business Review, September-October 1982, pp. 153-162.

Cheeseborough, Pamela H., and Davis B. Gordon, "Planning a Career Path in Information Systems," Working Paper Series, Management Information Systems Research Center, Graduate School of Business Administration, University of Minnesota, May 1981.

Crane, Janet, "The Changing Role of the DP Manager," Datamation, January 1982, pp. 97-108.

Davis, John J., "An EDP Cost Center - A Company Within A Company," S.A.M. Advanced Management Journal, Summer 1976, pp. 34-38.

Froehlich, Allan F., "Managing the Data Center as a Business."

Gibson, Cyrus F., and Richard L. Nolan, "Managing the Four Stages of EDP Growth," Harvard Business Review, January-February 1974, pp. 76-88.

Goldstein, David K., "The Effects of Structured Development Methods on the Job Satisfaction of Programmer/Analysts: A Theoretical Model," Working Paper 1130-82, Sloan School of Management, Center for Information Systems Research, M.I.T., May 1982.

Goldstein, David K., "A Further Examination of the Determinants of Job Satisfaction in Program/Analysts," Working Paper 1370-83, Sloan School of Management, Center for Information Systems Research, M.I.T., November 1982.

Grindlay, Andrew, "Very Senior Managers: What Is Their Role In Managing DP?," Business Quarterly, Winter 1982, pp. 9-12.

Johnson, Bob, "DP Executives Offer Map to Top," Computerworld, July 19, 198_, p. 2.

Karten, Howard A., "People Relationships Seen Key to Manager's Job," Computerworld, June 18, 1979, p. 12.

Keys, Bernard and Robert Bell, "Four Faces of the Fully Functioning Middle Manager," California Management Review, Summer 1982, pp. 59-67.

Kull, David, "Keep the Boss Happy: Organizations Expect More Than Processed Data From Their Information Executives These Days. What They Really Want Is Leadership." Computer Decisions, November 1982, pp. 174-180.

Lasden, Martin, "Avoid Political Traps: Play The Game To Win," Computer Decisions, July 1981, pp. 135-140.

Lauer, Peter H., and Richard D. Sbarbaro, "Recruitment: Who Will Lead the Computer Revolution?" Personnel Journal, October 1982, pp. 736-738.

Lauer, Peter H., and Richard D. Sbarbaro, "MIS Executives Face Changing Times," Financial Executive, August 1981, pp. 22-26.

Leffel, Daniel L., "Introduction to Business Information Management," presented to CISR, Sloan School of Management, M.I.T., November 15, 1982.

Leontiades, Milton, "Choosing the Right Manager to Fit the Strategy," The Journal of Business Strategy, pp. 58-69.

Mallory, Joseph S., "The Rising Tide of Information Management,"

Martin, Josh, "Choosing a Management Style," Computer Decisions, December 1981,

Mathias, James E., "Data Communications Management: Future Developments," Journal of Systems Management, November 1982, pp. 8-13.

McConkey, Dale and F.D. Barrett, "Managing In The Age Of The Robot," Business Quarterly, Winter 1982, pp. 40-46.

McKenney, James L., and F. Warren McFarlan, "The Information Archipelago - Maps and Bridges," Harvard Business Review, September-October 1982, pp. 109-119.

Miller, Guy E., "A Method for Forecasting Human Resource Needs Against Internal and External Labor Markets," Human Resource Planning, Volume 3, Number 4, 1980, pp. 189-200.

Myers, Edith, "Attack of the Micro," Datamation.

Nolan, Richard L., "Managing Information Systems By Committee," Harvard Business Review, July-August 1982, pp. 72-79.

Pitagorsky, George, "Industry Caught Up in Avoiding Change."

Price, Margaret, "MIS Still Outside the Inner Circle," Industry Week, November 1, 1982, pp. 51-54.

Quillard, Judith and Dale Goodhue, "Information Resource Management," prepared as a discussion draft for the CISR Endicott House Seminar, November 15-17, 1982, Center for Information Systems Research, Sloan School of Management, M.I.T.

Rochester, Jack B., "New Computer Architectures," Computerworld.

Ruth, Stephen D., "Computer Managers of the '80's: Only Generalists Need Apply," Journal of Systems Management, June 1981, pp. 26-29.

Seaman, John, "Up the Organization," Computer Decisions, June 1981, pp. 89-102.

Stone, Jack, "Reorganization Should Give DP More Clout," Computerworld, February 11, 1980, pg. 31.

Thackray, John, "You Can't Play if You Don't Know How," Datamation, October 1982, pp. 90-96.

Tichy, Noel M., Charles J. Fombrun, and Mary Anne Devanna, "Strategic Human Resource Management," Sloan Management Review, Winter 1982, pp. 47-61.

0520J:TAB:tmd

4221 U15

MIT LIBRARIES
3 9080 004 512 007

Date Due

Lib-26-67

CASEMENT

Bar Code On
Last Page

BASEME